

Environmental Stewardship Resource Desk

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COVID-19

1. **Future perspectives of emerging infectious diseases control: A One Health approach.**

McClymont H, Bambrick H, Si X, Vardoulakis S, Hu W. One Health. 2022 Jun;14:100371. doi: 10.1016/j.onehlt.2022.100371. Epub 2022 Jan 20.

<https://www.sciencedirect.com/science/article/pii/S2352771422000039>

Since the beginning of the COVID-19 pandemic in early 2020, global efforts to respond to and control COVID-19 have varied widely with some countries, including Australia, successfully containing local transmission, and minimising negative impacts to health and economies. Over this time, global awareness of climate variability due to climate change and the risk factors for emerging infectious diseases transmission has increased alongside an understanding of the inextricable relationship between the health of the environment, humans, and animals. Overall, the global response to the current pandemic suggests there is an urgent need for a One Health approach in controlling and preventing future pandemics, through developing integrated, dynamic, spatiotemporal early warning systems based on a One Health approach for emerging infectious diseases.

2. **What Are Sustainable Solutions for Pandemic Personal Protective Equipment?** Kleber J. Clin J

Oncol Nurs. 2022 Feb 1;26(1):120. doi: 10.1188/22.CJON.120.

<https://cjon.ons.org/cjon/26/1/what-are-sustainable-solutions-pandemic-personal-protective-equipment>

Since the inception of the COVID-19 pandemic, supply chains and hospital administrations have been trying to fulfill adequate personal protective equipment (PPE) for staff members to ensure their safety. With varying healthcare institutional policies, PPE has been deemed disposable so we do not lose its effectiveness. The Centers for Disease Control and Prevention recommends limiting the number of uses for an N95 respirator to no more than five because, at that many uses, it alters the fit for the wearer, leaving them exposed to droplets of a virus. However,

when we view this single-use mentality through a sustainable and environmentally conscious lens, what impact is this having on our planet and how can we meet this new challenge.

3. **Environmental impacts of the widespread use of chlorine-based disinfectants during the COVID-19 pandemic.** Parveen N, Chowdhury S, Goel S. *Environ Sci Pollut Res Int.* 2022 Jan 29;1-19. doi: 10.1007/s11356-021-18316-2. Online ahead of print.

<https://link.springer.com/article/10.1007%2Fs11356-021-18316-2>

Chlorinated disinfectants are widely used in hospitals, COVID-19 quarantine facilities, households, institutes, and public areas to combat the spread of the novel coronavirus as they are effective against viruses on various surfaces. Medical facilities have enhanced their routine disinfection of indoors, premises, and in-house sewage. Besides questioning the efficiency of these compounds in combating coronavirus, the impacts of these excessive disinfection efforts have not been discussed anywhere. The impacts of chlorine-based disinfectants on both environment and human health are reviewed in this paper. Chlorine in molecular and in compound forms is known to pose many health hazards. Hypochlorite addition to soil can increase chlorine/chloride concentration, which can be fatal to plant species if exposed. When chlorine compounds reach the sewer/drainage system and are exposed to aqueous media such as wastewater, many disinfection by-products (DBPs) can be formed depending on the concentrations of natural organic matter, inorganics, and anthropogenic pollutants present. Chlorination of hospital wastewater can also produce toxic drug-derived disinfection by-products. Many DBPs are carcinogenic to humans, and some of them are cytotoxic, genotoxic, and mutagenic. DBPs can be harmful to the flora and fauna of the receiving water body and may have adverse effects on microorganisms and plankton present in these ecosystems.

4. **Impact of COVID-19 on healthcare waste generation: Correlations and trends from a tertiary hospital of a developed country.** Garlasco J, Canepari A, Giacobone G, Funicelli G, Kozel D, Bernini L, Cotroneo A. *Waste Manag Res.* 2022 Jan 28;734242X221074195. doi: 10.1177/0734242X221074195. Online ahead of print.

https://journals.sagepub.com/doi/10.1177/0734242X221074195?url_ver=Z39.88-200

The SARS-CoV-2 (COVID-19) coronavirus pandemic has represented an emergency not only from a clinical point of view, but also for the environment due to the largely increased waste disposal. This study aimed at estimating, in the context of current trends, the increase in healthcare waste (HW) generation during the outbreak, based on data from a tertiary hospital. From the purveying office statements of 'SS Antonio e Biagio e Cesare Arrigo' Hospital of Alessandria (Italy), monthly HW generation data from January 2015 to March 2021 were retrospectively retrieved. Trends and COVID's impact were evaluated by Interrupted Time Series (ITS) design with linear regression models. Locally Weighted Scatterplot Smoothing was used to model the relation between infectious HW generation and proportion of COVID-related bed days. HW generation rose from 35.9 ± 3.8 tonnes month⁻¹ (2.4 ± 0.2 kg per patient-day, kg PD⁻¹) in 2015-2019, to 46.3 ± 6.0 tonnes month⁻¹ (3.3 ± 0.7 kg PD⁻¹) during the outbreak. The increasing trend was not appreciably modified as for its slope ($p = 0.363$), while a significant level change was found between baseline and outbreak ($+ 0.72$ kg PD⁻¹, $p < 0.001$). The proportion of COVID-related bed days non-linearly affected the infectious HW generated per patient-day, with steeper increases for proportions above 20%. The study showed a significant

rise in HW generation in 2020-2021, reasonably due to the COVID outbreak; in addition, the generally increasing trend was not affected. Therefore, urgent measures are needed to conciliate safety requirements with HW generation issues.

5. **Is Environmental Pollution Associated with an Increased Number of COVID-19 Cases in Europe?** Cifuentes-Faura J. *Int J Environ Res Public Health*. 2022 Jan 8;19(2):703. doi: 10.3390/ijerph19020703.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8775343/>

COVID-19 has caused an unprecedented crisis, resulting in a global pandemic with millions infected and dying. Given the importance given to sustainability and the reduction in pollutant gases in recent years, the main objective of this study was to determine whether pollutant emissions are associated with an increased number of COVID-19 cases in Europe. Other demographic variables that may have an impact on the number of coronavirus cases, such as population density, average age or the level of restrictive policies implemented by governments, are also included. It has been shown that the emission of carbon monoxide pollutant gases and pollutant emissions from transport positively affect the incidence of COVID-19, so that the sustainable policy implemented in recent years in Europe should be reinforced, and tougher sanctions and measures should be imposed when pollution thresholds are exceeded.

Health Impacts of Climate Change

6. **Occurrence and fate of polycyclic aromatic hydrocarbons from electronic waste dismantling activities: A critical review from environmental pollution to human health.** Ma S, Lin M, Tang J, Liu R, Yang Y, Yu Y, Li G, An T. *J Hazard Mater*. 2022 Feb 15;424(Pt D):127683. doi: 10.1016/j.jhazmat.2021.127683. Epub 2021 Nov 4.

Electronic waste (e-waste) is one of the fastest-growing solid wastes and has become an urgent issue due to the potential adverse consequences of exposure to emitted toxic pollutants, especially for these occupational exposed workers and local residents. In this review, the environmental occurrences, emission characteristics, sources, and possible adverse effects of polycyclic aromatic hydrocarbons (PAHs) emitted from primitive e-waste dismantling activities are summarized. In general, the atmospheric levels of PAHs at typical e-waste sites, e.g., in Guiyu, China, have substantially decreased by more than an order of magnitude compared with levels a decade ago. The PAH concentrations in soil from old e-waste sites in China are also generally lower than those at newly emerged e-waste sites in India, Pakistan and Ghana. However, elevated concentrations of PAHs have been reported in human milk, hair and urine from the populations near these e-waste sites. Source apportionment both from bench-scale studies to field observations has demonstrated that the pyrolysis and combustion processing of electronic circuit board are mainly responsible for the emissions of various PAHs. In addition, some specific PAHs and their derivatives, such as triphenylbenzene, halogenated and oxygenated PAHs, have frequently been identified and could be considered as indicators in routine analysis in addition to the 16 U.S. EPA priority PAHs currently used.

7. **Climate Change and Global Health: A Call to more Research and more Action.** Agache I et al. Allergy. 2022 Jan 24. doi: 10.1111/all.15229. Online ahead of print.

<https://onlinelibrary.wiley.com/doi/abs/10.1111/all.15229>

There is increasing understanding, globally, that climate change and increased pollution will have a profound and mostly harmful effect on human health. This review brings together international experts to describe both the direct (such as heat waves) and indirect (such as vector-borne disease incidence) health impacts of climate change. These impacts vary depending on vulnerability (i.e., existing diseases) and the international, economic, political and environmental context. This unique review also expands on these issues to address a third category of potential longer-term impacts on global health: famine, population dislocation, and environmental justice and education. This scholarly resource explores these issues fully, linking them to global health in urban and rural settings in developed and developing countries. The review finishes with a practical discussion of action that health professionals around the world in our field can yet take.

8. **Air pollution and cardiovascular disease: the Paul Wood Lecture, British Cardiovascular Society 2021.** Joshi SS, Miller MR, Newby DE. Heart. 2022 Jan 24;heartjnl-2021-319844. doi: 10.1136/heartjnl-2021-319844. Online ahead of print.

Air pollution is associated with up to 8.8 million excess deaths worldwide each year and is a major contributor to the global burden of disease. Cardiovascular conditions are the predominant cause for air pollution-related deaths and there is an urgent need to address the silent pandemic of air pollution on cardiovascular health. Air pollution exposure is associated with acute events like acute coronary syndrome and stroke, and with chronic conditions, such as atherosclerosis and heart failure. Several potential mechanisms have been proposed that link particle inhalation to cardiovascular disease including oxidative stress and inflammation, changes in autonomic balance and neuroendocrine regulation and the particle translocation into the circulation itself. This, in turn, can cause endothelial, vasomotor and fibrinolytic dysfunction and increased thrombogenicity and blood pressure which are implicated in the mediation of adverse cardiovascular events. Certain interventions can help mitigate these adverse effects. At an individual level, this includes the use of a facemask and indoor air purification systems. At an environmental level, interventions reducing the generation or release of combustion-derived pollutants are key and include public health policies to facilitate active transport, cleaner sources of energy and reductions in vehicular and fossil fuel emissions. In this review, we summarise the key pathways and mechanisms that draw together how air pollution can lead to adverse cardiovascular effects, as well as explore potential interventions to reduce the burden of air pollution-induced cardiovascular morbidity and mortality.

9. **Climate change and mental health: time for action and advocacy.** Power E, McCarthy N, Kelly I, Cannon M, Cotter D. Ir J Psychol Med. 2022 Jan 24;1-3. doi: 10.1017/ipm.2021.70. Online ahead of print.

https://www.cambridge.org/core/services/aop-cambridge-core/content/view/4D74F8C0A746649266BC054EFD1E540B/S0790966721000707a.pdf/climate_change_and_mental_health_time_for_action_and_advocacy.pdf

Climate change poses an existential threat to our planet and our health. We explore the intersections of climate change and mental health which has been under-recognised to date. Climate change can affect mental health directly through the effects of extreme weather events such as heat, drought and flooding, and indirectly through increasing rates of migration and inequality. Vulnerable individuals with neuropsychiatric disorders will be particularly at risk. Emerging evidence is also showing effects of air pollution on brain development. Mitigation efforts related to reducing carbon emissions will have both direct and indirect effects on mental health. A further consideration demonstrated by the COVID-19 pandemic is that the spread of infectious disease can have substantial effects on the mental health of the population. With climate change and biodiversity loss, pandemics could recur in the future with increasing frequency. It is now essential that mental health professionals be equipped as agents for climate action.

10. **Incident cardiovascular disease and long-term exposure to source-specific air pollutants in a Swedish cohort.** Carlsen HK, Andersson EM, Molnár P, Oudin A, Xu Y, Wichmann J, Spanne M, Stroh E, Engström G, Stockfelt L. *Environ Res.* 2022 Jan 21:112698. doi: 10.1016/j.envres.2022.112698. Online ahead of print.
RESULTS: Air pollution exposure levels (mean annual exposures to PM_{2.5} of 11 µg/m³ and NO_x of 26 µg/m³) within the cohort were moderate in terms of environmental standards. After adjusting for confounders, we observed statistically significant associations between NO_x and CHF (hazard ratio [HR] 1.11, 95% confidence interval [CI] 1.01-1.22) and NO_x and fatal MI (HR 1.10, 95%CI 1.01-1.20) per interquartile range (IQR) of 9.6 µg/m³. In fully adjusted models, the estimates were similar, but the precision worse. In stratified analyses, the associations were stronger in males, ever-smokers, older participants, and those with baseline carotid artery plaques. Locally emitted and traffic-related air pollutants generally showed positive associations with CHF and fatal MI. There were no associations between air pollution and MACE or stroke.
DISCUSSION/CONCLUSION: In an area with low to moderate air pollution exposure, we observed significant associations of long-term residential NO_x with increased risk of incident CHF and fatal MI, but not with coronary events and stroke.

11. **Long-term exposure to fine particulate matter and mortality: A longitudinal cohort study of 400,459 adults.** Guo C, Yu T, Bo Y, Lin C, Chang LY, Wong MCS, Yu Z, Lau AKH, Tam T, Lao XQ. *Epidemiology.* 2022 Jan 21. doi: 10.1097/EDE.0000000000001464. Online ahead of print. <https://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=ovft&AN=00001648-900000000-98187&PDF=y>
RESULTS: This study identified 14,627 deaths and had a total of 5 million person-years of follow-up. Each 10µg/m³ increase in PM_{2.5} was associated with an increased hazard risk (HR) of 29% (95% confidence interval [CI]: 24%-35%) in all-cause mortality. Risk of death increased by 30% for natural causes, 20% for cancer, 42% for cardiovascular disease (CVD) causes, and 53% for influenza and pneumonia causes, for each 10µg/m³ increase in PM_{2.5}. Sensitivity analyses generally yielded similar results.

CONCLUSION: Long-term exposure to ambient PM_{2.5} was associated with increased risks of all-cause mortality and deaths from cancers, natural causes, CVD, and influenza and pneumonia. Longitudinal study design should be encouraged for air pollution epidemiologic investigation.

12. **Evaluating health outcome metrics and their connections to air pollution and vulnerability in Southern California's Coachella Valley.** Miao Y, Porter WC, Schwabe K, LeComte-Hinely J. *Sci Total Environ.* 2022 Jan 20;153255. doi: 10.1016/j.scitotenv.2022.153255. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0048969722003461>

The ongoing desiccation of California's Salton Sea has led to increasing concerns about air quality and health for its surrounding communities, including the nearby Coachella Valley - a region already experiencing severe air quality and health disparities. Here we explore spatial air pollution and human health disparities in the Coachella Valley with particular attention to disparities arising across population characteristics including both socioeconomic and demographic vulnerabilities. We use two different measures of respiratory and cardiovascular health outcomes at the individual and census tract levels - one measure based on a randomly sampled telephone survey and the other measure based on emergency room visitation data - to investigate the degree to which these health outcomes are connected to air pollution and socioeconomic metrics. We further investigate biases and differences between the health outcome metrics themselves and suggest opportunities to address them in future analyses and survey efforts. We find that more vulnerable communities are associated with higher levels of fine particulates, but lower levels of ozone. While emergency visit rates show a significant positive correlation with both pollutants, no such association is found when using surveyed health outcome data. The ratio of emergency visits versus survey rates shows a positive relationship with socioeconomic and demographic vulnerability, indicating that vulnerable communities are less likely to self-report diagnoses despite higher rates of respiratory or cardiovascular hospitalization. Additionally, survey respondents tend to show less vulnerability relative to their surrounding census-based demographics. These findings suggest the need for greater attention to health issues specifically within disadvantaged communities in the Coachella Valley, building upon and working within existing community networks and local resources, to better address current and projected health needs. Our findings also highlight disparities in air pollution exposure, health outcomes, and population characteristics in the Coachella Valley, providing context for crucial pollution reduction efforts in the face of increasing environmental threats.

13. **A Children's Health Perspective on Nano- and Microplastics.** Sripada K et al. *Environ Health Perspect.* 2022 Jan;130(1):15001. doi: 10.1289/EHP9086. Epub 2022 Jan 26.

<https://ehp.niehs.nih.gov/doi/10.1289/EHP9086>

DISCUSSION: Few studies have addressed child-specific sources of exposure, and exposure estimates currently rely on generic assumptions rather than empirical measurements. Furthermore, toxicological research on NMPs has not specifically focused on child health, yet children's immature defense mechanisms make them particularly vulnerable. Apart from few studies investigating the placental transfer of NMPs, the physicochemical properties (e.g., polymer, size, shape, charge) driving the absorption, biodistribution, and elimination in early

life have yet to be benchmarked. Accordingly, the evidence base regarding the potential health impacts of NMPs in early life remains sparse. Based on the evidence to date, we provide recommendations to fill research gaps, stimulate policymakers and industry to address the safety of NMPs, and point to opportunities for families to reduce early life exposures to plastic. <https://doi.org/10.1289/EHP9086>.

14. **Impact of climate change and biodiversity collapse on the global emergence and spread of infectious diseases.** Williams PC, Bartlett AW, Howard-Jones A, McMullan B, Khatami A, Britton PN, Marais BJ. *J Paediatr Child Health*. 2021 Nov;57(11):1811-1818. doi: 10.1111/jpc.15681. <https://onlinelibrary.wiley.com/doi/full/10.1111/jpc.15681>

The reality of climate change and biodiversity collapse is irrefutable in the 21st century, with urgent action required not only to conserve threatened species but also to protect human life and wellbeing. This existential threat forces us to recognise that our existence is completely dependent upon well-functioning ecosystems that sustain the diversity of life on our planet, including that required for human health. By synthesising data on the ecology, epidemiology and evolutionary biology of various pathogens, we are gaining a better understanding of factors that underlie disease emergence and spread. However, our knowledge remains rudimentary with limited insight into the complex feedback loops that underlie ecological stability, which are at risk of rapidly unravelling once certain tipping points are breached. In this paper, we consider the impact of climate change and biodiversity collapse on the ever-present risk of infectious disease emergence and spread. We review historical and contemporaneous infectious diseases that have been influenced by human environmental manipulation, including zoonoses and vector- and water-borne diseases, alongside an evaluation of the impact of migration, urbanisation and human density on transmissible diseases. The current lack of urgency in political commitment to address climate change warrants enhanced understanding and action from paediatricians - to ensure that we safeguard the health and wellbeing of children in our care today, as well as those of future generations.

15. **Buy-now-pay-later: Hazards to human and planetary health from plastics production, use and waste.** Symeonides C, Brunner M, Mulders Y, Toshniwal P, Cantrell M, Mofflin L, Dunlop S. *J Paediatr Child Health*. 2021 Nov;57(11):1795-1804. doi: 10.1111/jpc.15777. <https://onlinelibrary.wiley.com/doi/10.1111/jpc.15777>

More than 8 billion tonnes of plastic were produced between 1950 and 2015, that is 1 tonne for every man, woman and child on our planet. Global plastic production has been growing exponentially with an annual growth rate of 8.4% since 1950, equating to approximately 380 million tonnes per annum. A further 50 kg of plastic is now being produced for each person every year with production continuing to accelerate. Here, we discuss the human and planetary health hazards of all that plastic. We consider each step in the journey of these complex and pervasive industrial materials: from their synthesis predominantly from fossil fuel feedstocks, through an often-brief consumer use as plastic products, and onto waste streams as fuel, permanent landfill or as unmanaged waste in our environment, food, air and bodies.

16. **Long-Term Exposure to Air Pollution, Road Traffic Noise, and Heart Failure Incidence: The Danish Nurse Cohort.** Lim YH et al. *J Am Heart Assoc.* 2021 Oct 19;10(20):e021436. doi: 10.1161/JAHA.121.021436. Epub 2021 Oct 6.

<https://www.ahajournals.org/doi/10.1161/JAHA.121.021436>

Methods And Results Using data on female nurses from the Danish Nurse Cohort (aged >44 years), we investigated associations between 3-year mean exposures to air pollution and road traffic noise and incident HF using Cox regression models, adjusting for relevant confounders. Incidence of HF was defined as the first hospital contact (inpatient, outpatient, or emergency) between cohort baseline (1993 or 1999) and December 31, 2014, based on the Danish National Patient Register. Annual mean levels of particulate matter with a diameter <2.5 μm since 1990 and NO₂ and road traffic noise since 1970 were estimated at participants' residences. Of the 22 189 nurses, 484 developed HF. We detected associations with all 3 pollutants, with hazard ratios (HRs) of 1.17 (95% CI, 1.01-1.36), 1.10 (95% CI, 0.99-1.22), and 1.12 (95% CI, 0.99-1.26) per increase of 5.1 $\mu\text{g}/\text{m}^3$ in particulate matter with a diameter <2.5 μm , 8.6 $\mu\text{g}/\text{m}^3$ in NO₂, and 9.3 dB in road traffic noise, respectively. We observed an enhanced risk of HF incidence for those exposed to high levels of the 3 pollutants; however, the effect modification of coexposure was not statistically significant. Former smokers and nurses with hypertension showed the strongest associations with particulate matter with a diameter <2.5 μm (Peffect modification<0.05). Conclusions We found that long-term exposures to air pollution and road traffic noise were independently associated with HF.

17. **Diabetes mellitus in the era of climate change.** Vallianou NG, Geladari EV, Kounatidis D, Geladari CV, Stratigou T, Dourakis SP, Andreadis EA, Dalamaga M. *Diabetes Metab.* 2021 Jul;47(4):101205. doi: 10.1016/j.diabet.2020.10.003. Epub 2020 Oct 27.

<https://www.clinicalkey.com/#!/content/journal/1-s2.0-S1262363620301567>

Worldwide, diabetes mellitus (DM) represents a major public-health problem due to its increasing prevalence in tandem with the rising trend of obesity. However, climate change, with its associated negative health effects, also constitutes a worrisome problem. Patients with DM are experiencing more visits to emergency departments, hospitalizations, morbidity and mortality during heat waves at ever-increasing numbers. Such patients are particularly vulnerable to heat waves due to impaired thermoregulatory mechanisms in conjunction with impaired autonomous nervous system responses at high temperatures, electrolyte imbalances and rapid deterioration of kidney function, particularly among those aged > 80 years and with preexisting chronic kidney disease (CKD). Moreover, exposure to cold temperatures is associated with increased rates of acute myocardial infarction as well as poor glycaemic control, although results are conflicting regarding cold-related mortality among patients with DM. In addition to extremes of temperature, air pollution as a consequence of the climate crisis may also be implicated in the increased prevalence and incidence of DM, particularly gestational DM (GDM), and lead to deleterious effects in patients with DM. Thus, more large-scale studies are now required to elucidate the association between specific air pollutants and risk of DM. This review presents the currently available evidence for the detrimental effects of climate change, particularly those related to weather variables, on patients with DM (both type 1 and type 2) and GDM. Specifically, the effects of heat waves and extreme cold, and

pharmaceutical and therapeutic issues and their implications, as well as the impact of air pollution on the risk for DM are synthesized and discussed here.

WE ACT

18. **Climate Change and Oncology Nursing: A Call to Action.** Dickman E, Backler C, Berg CD, Komandt M, Schiller J. *Clin J Oncol Nurs.* 2022 Feb 1;26(1):109-113. doi: 10.1188/22.CJON.109-113.

Climate change is a public health crisis that amplifies exposure to known carcinogens, leading to increased cases of cancer and other diseases. This clear link is a powerful reason for all oncology nurses concerned with cancer prevention and treatment to be involved in climate change solutions. The purpose of this review is to bring awareness to the consequences climate change has on the incidence and mortality of cancer, how it affects people living with cancer, and how oncology nurses can help mitigate these suboptimal outcomes.

19. **A holistic environmental and economic design optimization of low carbon buildings considering climate change and confounding factors.** Ansah MK, Chen X, Yang H. *Sci Total Environ.* 2022 Jan 26:153442. doi: 10.1016/j.scitotenv.2022.153442. Online ahead of print. The low carbon building design has become critical given the urgent need to reduce global carbon emissions. Reducing operational energy use through multi-objective optimizations used to be a common approach, but its validity is impaired by surging embodied impacts. Therefore, a life cycle optimization becomes necessary to improve the overall carbon performance of buildings. However, current research lacks an application of multi-objective optimizations to explore the energy use, carbon emission and cost considering both embodied and operational impacts. Impacts of confounding design factors and climate change on achieving low carbon designs are also not sufficiently revealed by existing studies. To address these gaps, this study: (i) proposes a parametric design optimization method for low carbon buildings considering cost-effectiveness, (ii) explores the impacts of confounding factors on achieving low carbon designs and (iii) evaluates the impact of climate change on the life cycle performance of buildings with proper scenario assumptions. A case study is conducted to explore passive design parameters and integrated photovoltaic (PV) applications to reduce the energy use and carbon emissions in a cost-effective approach. The joint optimization of embodied and operational impacts can reduce the energy use, carbon emission and cost by 42%, 58% and 32%, respectively. Also, variation of confounding factors can lead to different optimized designs with carbon reduction difference up to 75%. The results also show that global warming will lead to higher energy use and carbon emissions in tropical regions within the near future, while stringent mitigation strategies aligned with RCP 2.6 can reverse the trend after two decades.

20. **A review of the cost and effectiveness of solutions to address plastic pollution.** Nikiema J, Asiedu Z. *Environ Sci Pollut Res Int.* 2022 Jan 23:1-27. doi: 10.1007/s11356-021-18038-5. Online ahead of print.

<https://link.springer.com/article/10.1007%2Fs11356-021-18038-5>

Plastic usage increases year by year, and the growing trend is projected to continue. However as of 2017, only 9% of the 9 billion tons of plastic ever produced had been recycled leaving large

amounts of plastics to contaminate the environment, resulting in important negative health and economic impacts. Curbing this trend is a major challenge that requires urgent and multifaceted action. Based on scientific and gray literature mainly published during the last 10 years, this review summarizes key solutions currently in use globally that have the potential to address at scale the plastic and microplastic contaminations from source to sea. They include technologies to control plastics in solid wastes (i.e. mechanical and chemical plastic recycling or incineration), in-stream (i.e. booms and clean-up boats, trash racks, and sea bins), and microplastics (i.e. stormwater, municipal wastewater and drinking water treatment), as well as general policy measures (i.e. measures to support the informal sector, bans, enforcement of levies, voluntary measures, extended producer responsibility, measures to enhance recycling and guidelines, standards and protocols to guide activities and interventions) to reduce use, reuse, and recycle plastics and microplastics in support of the technological options. The review discusses the effectiveness, capital expenditure, and operation and maintenance costs of the different technologies, the cost of implementation of policy measures, and the suitability of each solution under various conditions. This guidance is expected to help policymakers and practitioners address, in a sustainable and cost-efficient way, the plastic and microplastic management problem using technologies and policy instruments suitable in their local context.

21. **Effect of HCl on a sorption of mercury from flue gas evolved during incineration of hospital waste using entrained flow adsorbers.** Szeliga Z, Honus S, Vavrova Z, Jirsa P, Vesely V, Carsky M, Vujanovic M, Regucki P, Krzyzyska R. *Waste Manag.* 2022 Jan 20;140:74-80. doi: 10.1016/j.wasman.2022.01.001. Online ahead of print.

Small incinerators of dangerous wastes, including those from hospitals, are a source of emissions of highly variable compositions and concentrations. Mercury is a very dangerous pollutant causing neurotoxicity in human organism. The effect of HCl concentration on adsorption of mercury on activated carbon-based sorbent was studied for the incineration of hospital waste in a 250 kg/h capacity unit. The maximum concentration of adsorbed mercury on activated carbon was determined as a function of concentration of Hg and HCl in combustion products. Based on the expected chemical reactions and the thermodynamics, the adsorption of mercury from flue gases in oxidising atmosphere has been explained. The activated carbon-based sorbent was also capable of adsorbing acid gases like HCl. The efficiency of removal of mercury from combustion products increased up to 85-87% with the concentration of HCl in flue gases. The addition of calcium hydroxide increased the amount of mercury trapped on the sorbent only by about 10%. These tests proved that an entrained flow adsorber is a suitable unit for the removal of mercury from combustion products. The consumption of activated carbon for the mercury removal was from 0.1 to 0.15 mg/Nm³ of flue gas. The advantage of an entrained flow adsorber lies in its easy continuous operation. Therefore, it is a suitable unit for small and medium size incinerators of municipal and hospital waste.

22. **Geriatric medicine in the era of climate change.** Davies B, Bhutta MF. *Age Ageing.* 2022 Jan 6;51(1):afab199. doi: 10.1093/ageing/afab199.

Climate change has been termed the greatest threat to human health of the 21st century. Older people and those living with frailty are more vulnerable to the effects of climate change

including heatwaves and extreme weather events, and therefore, we have a responsibility to advocate for action on the climate emergency and take steps to reduce the environmental impact of our care provision. The NHS contributes 5.7% to the carbon footprint of the UK, and by reviewing the financial costs associated with frailty, we estimate the carbon footprint of frailty to be 1.7 MtCO₂e, or 7% of the total NHS carbon footprint. Resource use also increases with age with particular interventions and medical equipment such as hearing and mobility aids being predominantly associated with the care of older people. The NHS has committed to net zero carbon emissions by 2045 and in order to achieve this we all need to act-balancing the triple bottom line of environmental, social and financial impacts alongside outcomes for patients and populations when making decisions about care. The principles of sustainable healthcare are already embedded in the geriatrician's holistic approach to the care of older people and those living with frailty, and the imperative to reduce the carbon footprint of healthcare should add weight to the argument for extending the role of the geriatrician into other specialties. It is time to begin our journey to net-zero geriatric medicine.

23. **Neuroscience and climate change: How brain recordings can help us understand human responses to climate change.** Wang S, van den Berg B. *Curr Opin Psychol.* 2021 Dec;42:126-132. doi: 10.1016/j.copsyc.2021.06.023. Epub 2021 Jul 10.

<https://www.sciencedirect.com/science/article/pii/S2352250X21000956>

There is little published neuroscience research on the psychology of climate change. This review outlines how carefully designed experiments that measure key neural processes, linked to specific cognitive processes, can provide powerful tools to answer research questions in climate change psychology. We review relevant literature from social neuroscience that can be applicable to environmental research-the neural correlates of fairness and cooperation, altruistic behaviour and personal values-and discuss important factors when translating environmental psychology constructs to neuroscientific measurement. We provide a practical overview of how to implement environmental neuroscience using electroencephalography, summarising important event-related potential components and how they can be used to answer questions in climate change psychology. Challenges for the field include accurate attribution of findings, both within and between studies, the need for interdisciplinary collaboration, peer review and reporting processes.

24. **Employee green behaviour: How organizations can help the environment.** Unsworth KL, Davis MC, Russell SV, Bretter C. *Curr Opin Psychol.* 2021 Dec;42:1-6. doi: 10.1016/j.copsyc.2020.12.006. Epub 2020 Dec 24.

Organizations are intrinsically involved in climate change - both in its causes and its solutions - and there has been a growing interest in the microfactors and macrofactors that affect employee green behaviour. On an employee level, the literature stresses the importance of values and self-concordance. On an organizational level, in contrast, recent developments emphasize environmental dynamic capabilities, leadership and human resource management practices such as training. However, an interplay between such microfactors and macrofactors suggests that organizational initiatives do not work uniformly but depend on employees' environmentalism. We thus highlight the need for a dynamic systems perspective in researching all types of employee green behaviour in organizations.

25. **The effects of ideological value framing and symbolic racism on pro-environmental behavior.** Makovi K, Kasak-Gliboff H. *Sci Rep.* 2021 Nov 12;11(1):22189. doi: 10.1038/s41598-021-00329-z.

<https://www.nature.com/articles/s41598-021-00329-z>

Environmental degradation continues to be one of the greatest threats to human well-being, posing a disproportionate burden on communities of color. Environmental action, however, fails to reflect this urgency, leaving social-behavioral research at the frontier of environmental conservation, as well as environmental justice. Broad societal consensus for environmental action is particularly sparse among conservatives. The lack of even small personal sacrifices in favor of the environment could be attributed to the relatively low salience of environmental threats to white Americans and the partisan nature of environmentalism in America. We evaluate if (1) environmental action is causally related to the ideological value framing of an environmental issue; and (2) if the perceived race of impacted communities influences environmental action as a function of racial resentment. With this large-scale, original survey experiment examining the case of air-pollution, we find weak support for the first, but we do not find evidence for the second. We advance our understanding of environmental justice advocacy and environmental inaction in the United States.

26. **Ethical considerations regarding the effects of climate change and planetary health on children.** Williams PC, Marais B, Isaacs D, Preisz A. *J Paediatr Child Health.* 2021 Nov;57(11):1775-1780. doi: 10.1111/jpc.15704.

<https://onlinelibrary.wiley.com/doi/10.1111/jpc.15704>

Climate change represents one of the most significant health challenges and global inequities of our generation. As a 'wicked' problem, climate change imposes an involuntary exposure on vulnerable individuals and societies that is regressive in its nature, with those least responsible for destroying planetary health at greatest risk of suffering the direct and indirect health consequences of unabated warming of the planet. The current and future generations of children are the most vulnerable population to suffer the effects of climate change. By 2030, there will be 131 000 additional child deaths each year if climate mitigation strategies are not enacted, driven by the synergy of an increasing burden of infectious diseases, food insecurity and political instability. Over half a billion of the world's children live in areas vulnerable to extreme weather events, and there is a pressing risk that our current lack of action to mitigate and adapt to climate change will result in today's children, and future generations, being the first to have poorer physical and mental health than previous generations - creating a significant intergenerational ethical dilemma. Child health-care professionals need to advocate for policies to address climate change that consider the complex health, planetary and ethical considerations necessary to solve the most significant risk to our children's health today. Without immediate action, the health of the current and future generations of children is perilous.

27. **Delivering environmental sustainability in healthcare for future generations: Time to clean up our own cubby house.** Kiang KM, Behne C. *J Paediatr Child Health.* 2021 Nov;57(11):1767-1774. doi: 10.1111/jpc.15746.

<https://onlinelibrary.wiley.com/doi/10.1111/jpc.15746?af=R>

Children and future generations will be those most affected by climate change, and paediatricians have a moral responsibility to preserve a secure and habitable world for them. Despite our pledge to 'first do no harm', the health-care sector itself is a major contributor to global warming and environmental degradation. These contributions are projected to rise unless urgent measures are undertaken to decarbonise. Fortunately, an increasing number of individuals, health institutions, organisations and government agencies are taking action to shift this trajectory. Opportunities to reduce emissions and improve environmental sustainability in the health-care sector are vast. If done well, sustainable climate-smart health care offers opportunities for financial, environmental, and social gains - a 'triple win'. By getting our own house in order, the health sector can influence action throughout our economy and society, realise the health co-benefits of climate action and fulfil our obligation to help minimise the growing health impacts of climate change.

28. **Lighting a candle, or cursing the darkness? Delivering a climate friendly anaesthetic.** Skowno J, Weatherall A. *J Paediatr Child Health*. 2021 Nov;57(11):1781-1784. doi: 10.1111/jpc.15760. With up to 7% of national emissions coming from health care in industrial nations, and volatile anaesthetics and nitrous oxide being particularly effective greenhouse gases, anaesthetists can potentially reduce their medical carbon footprint substantially. Operating theatres create 25% of hospital waste, and there are many other avenues for 'greening' in the perioperative environment, including recycling and avoiding unnecessary operations. However, it is vital to understand how to produce a real change in practice that continues into the future and is normalised. Health-care choices we make in 2021 cannot be allowed to lead to a climate catastrophe in 2050.
29. **Monitoring climate change and child health: The case for putting children in all policies.** Romanello M, McGushin A, MacGuire FAS, Sly PD, Jennings B, Requejo J, Costello A. *J Paediatr Child Health*. 2021 Nov;57(11):1736-1740. doi: 10.1111/jpc.15757. Climate change is threatening the health of current and future generations of children. The most recent evidence from the Lancet Countdown: Tracking Progress on Health and Climate Change finds declining trends in yield potential of major crops, rising heatwave exposures, and increasing climate suitability for the transmission of infectious diseases, putting at risk the health and wellbeing of children around the world. However, if children are considered at the core of planning and implementation, the policy responses to climate change could yield enormous benefits for the health and wellbeing of children throughout their lives. Child health professionals have a role to play in ensuring this, with the beneficiaries of their involvement ranging from the individual child to the global community. The newly established Children in All Policies 2030 initiative will work with the Lancet Countdown to provide the evidence on the climate change responses necessary to protect and promote the health of children.
30. **Communicating about climate change - Who is listening, who isn't and why: Implications for medical professionals.** Foong LH, Huntley R. *J Paediatr Child Health*. 2021 Nov;57(11):1826-1829. doi: 10.1111/jpc.15717. Epub 2021 Sep 21. <https://onlinelibrary.wiley.com/doi/full/10.1111/jpc.15717>

Community concern about climate change in the community in general is strong and getting stronger but greater action on climate change is contingent upon whether the public sees strong links between climate effects and personal and community wellbeing in the present as well as the future. Medical and health-care professions can be effective messengers about the impacts of climate given their trusted status and ability to draw connections between climate change and physical and mental health.

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